The Effect of Failing to Recapitalize the B-52H Defensive Avionics System on Future Operations

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The relevance of legacy systems such as the B-52 on future operations is a concern because many of our current capabilities are dependent on these systems. Despite the fact that the B-52 is almost 60 years old it still remains the backbone of the strategic bomber fleet because of the number of available airframes and the flexibility to perform a wide range of missions from close air support to nuclear deterrence. The B-52 is an important component of the Air Force arsenal because of its unique ability to carry a tremendous payload of over 40 different types of munitions, and its ability to strike anywhere on the globe with aerial refueling on short notice As surface-to-air missile threats posed by other nations increase with technology improvements over time, the risks faced by the aircraft are inherently greater. New generations of these missiles contain threats the current system was never designed to protect against. The aircraft may have crucial vulnerabilities to electronic warfare threats in the future due to the unsupportability from a logistics perspective and obsolescence of the ALQ-155 jamming system. This paper will analyze the situation in the recent past and current situation using a quantitative study, which includes mission capability rate data and surveys sent to the field to determine the scope of the problem. Following analysis of the gathered data several proposed solutions will be given along with rationalization of the strengths and weaknesses of each proposal. The escalating costs of supporting the legacy B-52 ECM system requires a comprehensive structured approach if the airframe is to remain a viable platform until its projected retirement in 2040.

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Abstract

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Introduction

Overview

This study analyzed data gathered from Air Combat Command (ACC) headquarters, as well as, data received from the B-52 Systems Program Office and the Electronic Systems Program Office. This data was used to determine if vanishing vendors and parts obsolescence are affecting the supportability of the defensive avionics system on the B-52, and in turn, affecting the mission capability (MC) rate of the platform. Information was also gathered from the 5^{th} and 2^{d} Bomb Wings to acquire user input on the impact of the problem.

Problem Statement

The Air Force lacks the ability to maintain the ALQ-155 defensive avionics system on the B-52 beyond the short term because of lack of spare line replaceable unit (LRU) repair parts due to vanishing vendors, lack of repair capability, low system reliability, and increasing costs. This study will determine if the B-52 can remain a viable platform in a future conflict as described in current 8 AF employment doctrine if the defensive avionics system is not recapitalized. Consequently, has the failure to upgrade the ALQ-155 system had a negative effect on the mission capability of the B-52? Finally, it will propose how Air Force Materiel Command (AFMC) could address the problem to keep the B-52 a viable weapon system until its scheduled retirement date in 2040.

Importance/Relevance of Research

The Air Force has recently upgraded the B-52 aircraft with an Avionics Midlife Improvement program. This program is focused on the offensive avionics of the aircraft to allow it to drop the latest guided weapons and improve the navigation system. The program does not address the defensive avionics systems of the aircraft, which are critical to survivability of the airframe in a hostile environment. These systems are plagued with high failure rates, which require a large stock of spare assets to keep the system functional. The spare assets are increasingly difficult to procure because of vanishing vendors. For purposes of this study a vanishing vendor is defined as the inability to find a vendor to bid on a contract due to obsolete technology or high cost associated with item manufacturing. A recent example of the vanishing vendor problem making a system unsupportable on the B-52 is the ALR-20 system, which had a 6-gun cathode ray tube (CRT) similar to an old fashioned television vacuum tube. It could no longer be repaired due to obsolete technology and high cost to sustain.

The relevance of legacy systems such as the B-52 on future operations is a concern because many of our current capabilities are dependent on these systems. The B-52 is an important component of the Air Force arsenal because of its unique ability to carry a tremendous payload of over 40 different types of munitions, and its ability to strike anywhere on the globe with aerial refueling on short notice. The aircraft is also an important nuclear strike asset in the newly devised Global Strike Command according to CSAF General Norton Schwartz.[1] Inability to sustain the spare parts required to maintain the ALQ-155 system will make the defensive avionics system inoperable.

According to the minimum essential subsystem listing for B-52 aircraft, a serviceable ALQ-155 system is crucial to a fully mission capable aircraft for anything other than training missions. Lack of this system prevents the aircraft from countering low band radar threats, such as anything newer than SA-6 surface-to-air missiles, and would mean the aircraft could not penetrate into a hostile electronic countermeasures (ECM) environment. This fact could be critical to its use in a future conflict potentially with Iran, which has purchased 29 SA-15 mobile medium range surface-to-air systems from Russia. These highly advanced systems are capable of engaging 2 targets simultaneously and tracking up to 48.[2] Iran may also have highly capable SA-10 long range all altitude systems with as many as 90 missiles, so having a capable ECM system is critical to aircraft survivability. All of these systems take advantage of a track-on-jam mode which allows the missile to guide to the source of the airborne jamming.

Currently, to prevent wear and tear on system parts and premature failure of difficult to repair parts, specific procedures have been put in place for training missions. During these types of missions the electronic warfare officers (EWOs) place the transmitter in a stand-by mode to prevent cold soaking, which is a condition where cold temperatures at operating altitude permeate electronic components and causes them to fail prematurely with the reapplication of power.[3]

B-52 Usage in Recent Conflicts

To understand the B-52s value to future operations its contributions in past conflicts must be appreciated. It was the primary deterrent nuclear bomber on alert during the Cold War and was instrumental during the bombing campaign in North Vietnam. During Arc Light missions and later Operations Rolling Thunder and Linebackers I and II twenty-one aircraft were lost and several more were severely damaged by surface-to-air missiles.[4] These losses demonstrated the need for a reliable self-protection system for such a large aircraft to be successful.

Despite its age the B-52 is still a vital tool in the Air Force arsenal as displayed by its contributions in more recent conflicts from Operation Desert Storm to Bosnia and finally current ops in Operation Iraqi Freedom (OIF) in Iraq and Operation Enduring Freedom (OEF) in Afghanistan. All of the recent conflicts in which the B-52 has participated in have been in a permissive air threat environment where engagement by surface-to-air missiles is minimal or altogether absent. This may not be the case in a future potential conflict with a capable adversary such as Iran. In such a conflict a self-protecting capable ECM system would be paramount to aircraft survivability.

During Operation Desert Storm, B-52s were called upon to be ready to interdict Iraqi forces should they decide to invade Saudi Arabia. B-52 bombing posed a significant threat to the lives of the frontline Iraqi forces below. Enemy prisoners reported that B-52 strikes on troops consumed almost all of their effort and were more devastating than any other platform.[5] Major David Schneider's article "Heavy Bombers Holding the Line" in Airpower Journal (Winter 1994), explained the value of the B-52 in Bosnia,

> The B-52 played a crucial role in the war in Bosnia. Until NATO reached a consensus to support US involvement, NATO ordered that all of its forces stationed in Europe be restricted to defensive combat operations only. This seriously limited support for US operations during the opening days of the war. The task then fell to heavy bombers capable of CONUS-to-CONUS operations to provide the muscle behind the effort to halt the initial Serbian drive. The B-52 missions were able to penetrate hostile airspace and deliver their munitions with complete tactical surprise. They struck the regional air defense center in Serbia and the forward control centers in Bosnia. The B-52s, backing up the B-2s, used their precision strike capability to knock out the hardened command bunkers and B-52s armed with precision guided munitions systematically dropped the bridges that first night. The recent installation of the improved forward looking infrared radar monitor and the laser detection and ranging system gave the B-52s the accuracy they required for tracking targets along roads and for delivering general

purpose weapons accurately from the altitudes that kept them out of range of tactical anti-aircraft artillery and surface-to-air missiles.[6]

Later, during OIF and OEF, the B-52 was used extensively in interdiction and close air support missions using GPS-directed JDAMs for outstanding accuracy.

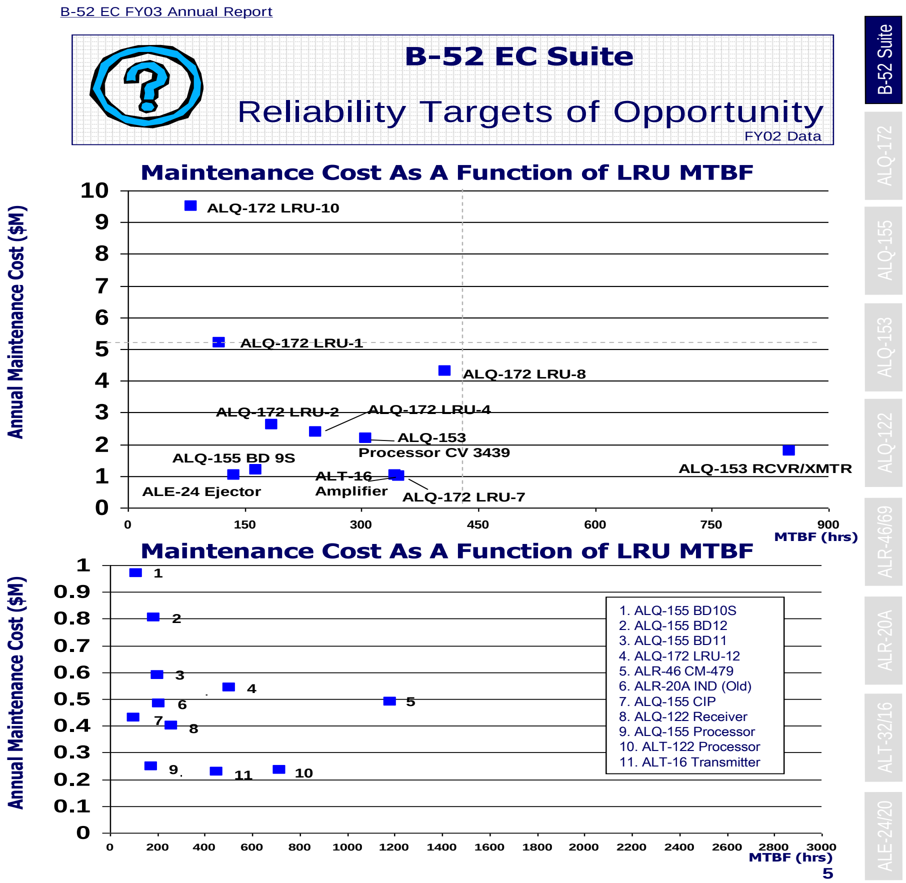

Figure 1 LRU Maintenance Costs vs. MTBF

Discussion of Problem

The present defensive avionics system designed in the 1960s and 1970s includes the ALR-20 display system, the ALQ-172 (high/medium band width jammer), and the ALQ-155. The ALQ-155(V) Power Management System, consisting of ten transmitters, is a low to mid-band transmitting and receiving countermeasures system that can operate in manual, semi-automatic, and automatic modes providing 360 degree coverage in the D, E, F, G, and H radar bands.[7] The system, originally built by the Hallicrafters Company and enhanced by Northrop Grumman at Rolling Meadows, Illinois in the mid 1970s, protects the aircraft from radar guided anti-aircraft missiles by countering the electronic frequencies emitted by these systems. The system acts as a computerized vintage barrage/noise jamming system which controls jamming transmitters and receivers. The system's display feature provides electronic countermeasures to include detection, jamming and infrared countermeasures against fire control radar systems and associated missiles.

The existing ALR-20 system provides the EWO with the capability of simultaneously surveying and detecting all radio frequency transmissions within the frequency range of coverage. It displays the detected signals and identifies the best way to deal with the threat. It takes inputs from the ALQ-172 and the ALQ-155, and then recommends proper response to the electronic signature. The ALR-20 became completely unsupportable due to vanishing vendors for repair parts. Parts of this system including the 6-gun CRT, referenced earlier, were replaced with a commercial off-the-shelf item built by Condor Systems called the "Buffscope" in 2002, which has allowed the system to continue functioning.

The ALQ-172 system is newer than the ALQ-155 and does not suffer from the same vanishing vendor issues due to its improved technology. The ALQ-155 system problems initially began in FY96/97, like the ALR-20, it has LRU repair parts which have vanishing vendor problems, particularly the Backwards Wave Oscillators (BWO) which are very difficult to manufacture and are very labor intensive to repair. Compounding this problem is the low reliability of these items, in some cases less than 100 hours mean time between failures as shown in Figure 1.[8]

A repair capability for the obsolete technology BWO tubes is currently being established by the AFMC program managers at Warner Robins Air Logistics Center. This capability is considered limited because many BWO tubes are deemed unrepairable due to their age and mode of failure. The BWO tubes are no longer supported by industry and they are difficult and expensive to repair. This effort will provide a small extension to the service life of the existing BWOs. There is also an effort underway to replace the BWOs with Traveling Wave Tubes or Microwave Power Modules. As there is no "drop-in" replacement for the BWO tube, this effort requires extensive redesign of the ALQ-155 power supply and frequency control assembly.

The Air Force also failed to buy enough spare BWOs when a lifetime buy purchase was made in the early 1990s, only enough were purchased to sustain the system through 2010.[9] Funding for spare parts has also become an issue because of the expense to maintain the commercial production of these parts, and because the Air Force has projected to upgrade the system within the next 5 years by replacing some of the more problematic LRUs with newer, more reliable electronics. The problem with this LRU replacement is the constrained budget environment which may cancel the upgrade all together and the fact that the upgrade is piecemeal and not system wide. So with no replacement system in place, the current ALQ-155 system with all of its high-cost repair parts will have to be maintained as shown in Figure 2.

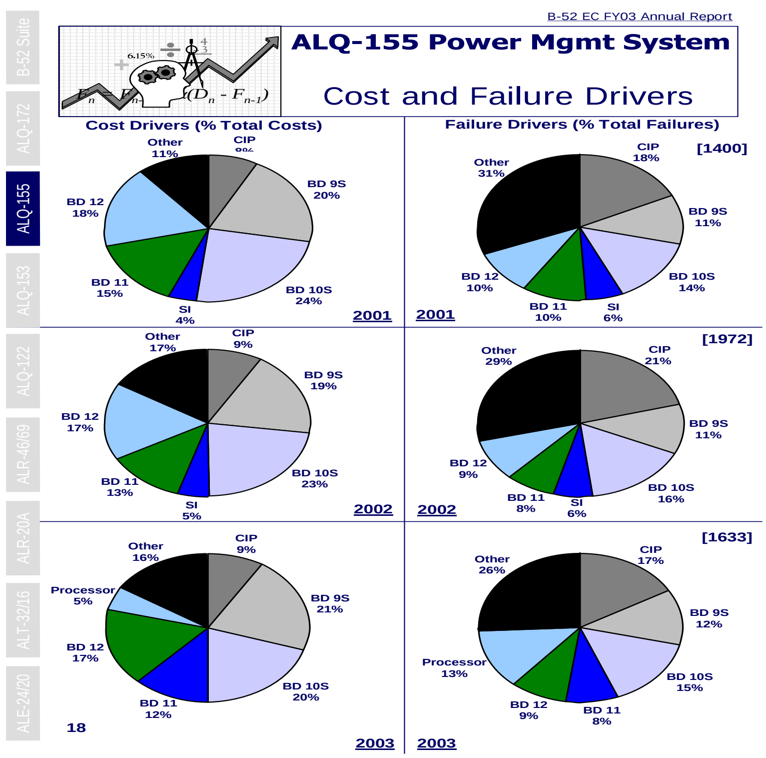

Figure 2 Cost Failure Drivers

Methodology

Assumptions

The first assumption is that the Air Force will continue to fund spare parts for B-52 at current level. Spare parts funding is critical because lack of funding will mean fewer spare parts procured which will mean less serviceable LRUs available for the field. This lack of spare LRUs would drive the total non mission capable supply (TNMCS) rate up and the MC rate down. The second assumption is that the B-52 will continue to perform its current mission to include penetration into the low/medium surface-to-air threat environment and will not be tasked to penetrate a high threat environment which could increase parts usage. The third assumption is that the reliability of ALQ-155 LRUs will continue at their historical level.

Research Design

The nature of this research project is a problem/solution format focused on the known variables of historical parts usage, system reliability, and programmed requirements to ensure data collected is valid. A survey was used to collect base level inputs on the problem. Gathered data will provide validation of the problem and give a solid foundation for recommendations.

First, weapon system MC rate data from the previous 2 fiscal years (FY07-FY08) will be used to identify if there have been any negative aircraft readiness trends that are attributable to a high TNMCS rate, also for historical reference earlier data will be evaluated. The supply data will then be analyzed to identify if the ALQ-155 system was a contributor to the either of the two previously identified rates and if so how much of an impact on the total rate was it.

Next, I'll identify if sufficient quantities of ALQ-155 serviceable or reparable assets were on-hand at depot to meet the historical LRU consumption rates computed by the

AFMC item manager. Keeping production equal to demand is critical because the assets are 2-level repair items that have to be fixed at a depot with no repair authorized in the field, therefore any shortage of LRUs would immediately impact missions. The repair asset flow days of how long items remained in the repair cycle at the depot will be evaluated. If assets exceed the standard flow time, the reason for this delay will be identified to determine if the item had a vanishing vendor. Readiness Spares Package (RSP) fill rates for ALQ-155 LRUs for the past two years will determine if there was a shortage of replacement assets in the kits versus the number identified as required to be on hand in the kits.

Finally, a survey with a target population of flightline and backshop production superintendents, flight chiefs, flight OICs and maintenance operations officers will identify the field's perspective on the ALQ-155 system and any wing level impact associated with its low reliability.

Survey Details

To study the impact of defensive avionics issues on the field, a survey questionnaire was sent to maintenance leadership which included all levels from the group commander down to the flight chief level at Barksdale AFB and Minot AFB. This survey attempted to quantify the impact of maintaining the defensive avionics system on the wings' mission. This questionnaire was the sole tool utilized to measure this impact. It attempted to show whether the low reliability and hard to acquire parts resulted in a change to scheduled maintenance or the daily flying schedule. Additional questions were asked to measure if parts delays drove further cannibalization actions and man-hours expended in cannibalization. This action takes man-hours away from other scheduled maintenance activities. Answers from this questionnaire were entered into a Microsoft Excel spreadsheet to calculate the number of areas impacted. The sample size was 30 respondents, with a total of 40 surveys sent out. The number of surveys received from avionics experts at Barksdale AFB and Minot AFB was used as a representation of the views of the over 120 technicians assigned at both locations. The measurement technique was quantification and tabulation of survey results.

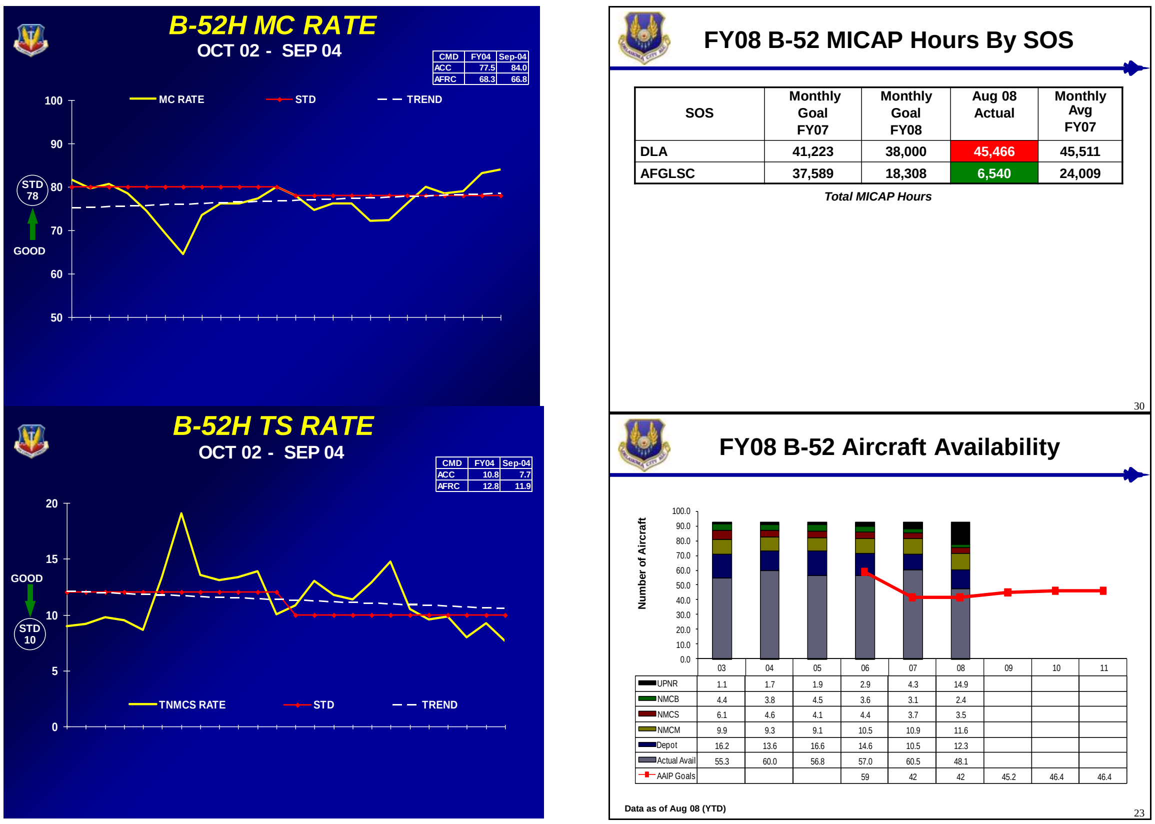

Figure 3 MC Rate and MICAP Data

Findings

The overall findings from the data gathered and survey results do not support the thesis conclusion that there is an immediate crisis or impending failure of the current defensive avionics system at this time. The short-term solutions referenced in this paper have maintained capability and delayed unsupportability of the system. Although the system is currently being maintained in a viable condition, this does not minimize the fact that as it continues to age supportability will become even more difficult and costly. Another factor that must be considered is that the data gathered reflects system status at a particular moment in time and could change quickly toward the negative with increased usage or failures. For this reason inaction is a dangerous option.

The research indicates no significant impact from the ALQ-155 system on TNMCS time since 2002 and more recently 2008 as shown in Figure 3. During the time period studied the ALQ-155 system has not affected the B-52 MC rate and none of the system's LRUs made the B-52 top-5 mission capability impacting parts list (MICAP). These parts prohibit the aircraft from performing its assigned mission and in many cases the aircraft is grounded. The ALQ-155 LRUs accounted for 216 MICAP hours in FY08, which is less than 1% of the total of 166,638 MICAP hours for the B-52 shown in Figure 7.[10]

In contrast, during the period from October 1996 until March 1997 the B-52 ECM suite was the leading cause of ACCs B-52 bomber wings not meeting fleet MC rate standards. The aircraft's three major defensive systems all combined to produce a six month MICAP driver rate for the B-52 fleet of more than 43,000 hours.[11] In addition, RSP kits were depleted of several key system line replaceable units. This resulted in a significant impact to the operational readiness of the entire B-52H fleet and a corresponding 4% drop in MC rate.[12] The problems were associated with lack of spare parts to repair the system LRUs primarily because in FY97, the B-52 fleet received only six percent of the overall bomber budget which further complicated efforts to maintain these aging ECM systems.

To address the problem in the short term in the late 1990s, the Air Force made a decision to fund spare parts at a higher level. This increase in spare parts funding allowed the procurement of long lead time, difficult to manufacture parts to continue to maintain the ALQ-155 system. During the past two quarters of 2008 the demand rate for LRUs has averaged 33 for each quarter. The average number of reparables on hand at the depot is 120 with the amount being repaired quarterly at 41. The average flow time from the field including deployed locations is 5 days with a time in repair of 11 days.[13]

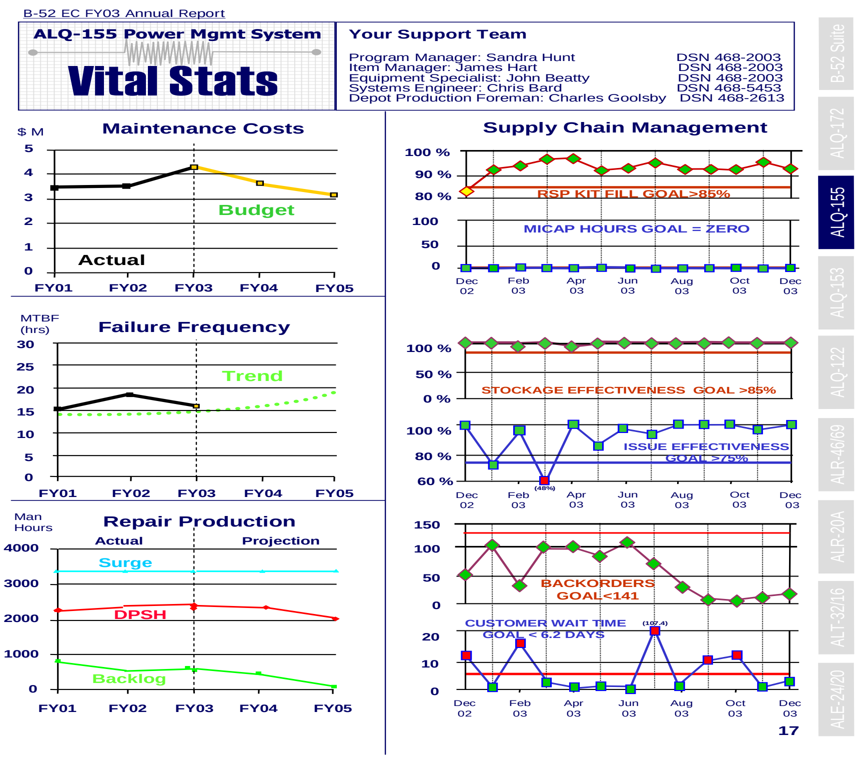

Figure 4 RSP Fill Rate Data

The fill rate on the RSP kits at Barksdale AFB and Minot AFB is 91% well above the 86% goal as shown in Figure 4.[14] The field surveys mirror this same situation. The 30 personnel surveyed believe there are enough assets in the field to support the system and there has been no delayed missions and minimal cannibalizing due to lack of spare parts as shown in Annex A.

ALQ-155 Upgraded LRU

Current Situation

As a short term, stop gap solution, Northrop Grumman began updating the ALQ-155 self-protection system on the B-52 in late 2005 by installing digital replacement cards for the control indicator-programmer portion of the system as seen above. The new cards replace the less reliable analog technology and provide greater radio frequency stability, lower initial costs and less maintenance. The digital replacement cards make use of field programmable gate-array technology that allows them to be updated through software changes avoiding expensive replacement costs. The new cards also have the capability of updating the ALQ-155 protection schemes in minutes to adjust to evolving threats.[15] At a later time they will add miniature microwave power module-transmitter technology as well as adding an integrated monolithic microwave and digital exciter system with other commercial processors.[16] Northrop Grumman was provided $32.5M in June 2006 for engineering services in a contract from WR-ALC (F09603-D-0002-0093) for this upgrade.[17]

Local contractor repair capability has been set-up at both B-52 locations allowing LRU circuit boards to be repaired in the field, thus precluding MICAP conditions in FY08, as shown in Figure 7. ECM systems were not on the top-5 MICAP list for this period however, both of these actions listed above are just alleviating a potential current MICAP situation by crisis management and focusing funding on the current obsolete system. In contrast, during FY08 lower priority backorders have continued to rise due to obsolescence issues and failure rates with the vintage EW systems. The inaction on adopting long term solutions is only prolonging supportability of the current system by pushing the can down the road.[18]

Recommendations

Despite the relatively healthy posture of the ALQ-155 system today, the need still exists to pursue implementation of a more current, reliable replacement for the ALQ-155. A replacement system is required for the 76 primary authorized aircraft because according to the 2002 Nuclear Posture Review the high failure rate and inability to adapt to and counter threats will limit the B-52 in the combat environment beyond 2006.[19]

It is crucial that the B-52 ECM suite be upgraded as a whole because the systems are interdependent. Situational awareness and survivability upgrades for parts of the ALQ-172 including addition of a third ALQ-172 system to enhance capabilities and upgrades to the ALR-20 system consisted of electronic counter measures improvement (ECMI) and situational awareness defensive improvement (SADI). ECMI replaced two older control display units (CDUs) with one new CDU and a 1553 data bus to provide enhanced intra-system communication providing the ability to respond to changes to the threat and maintain situation awareness (SA) and rear aircraft protection.[20] SADI replaced the unsupportable ALR-20 panoramic receiver and restored early warning and combat SA. The above mentioned modifications have been completed but only addressed the problem in a piecemeal fashion. To date nothing is scheduled to replace the ALQ-155 system.[21]

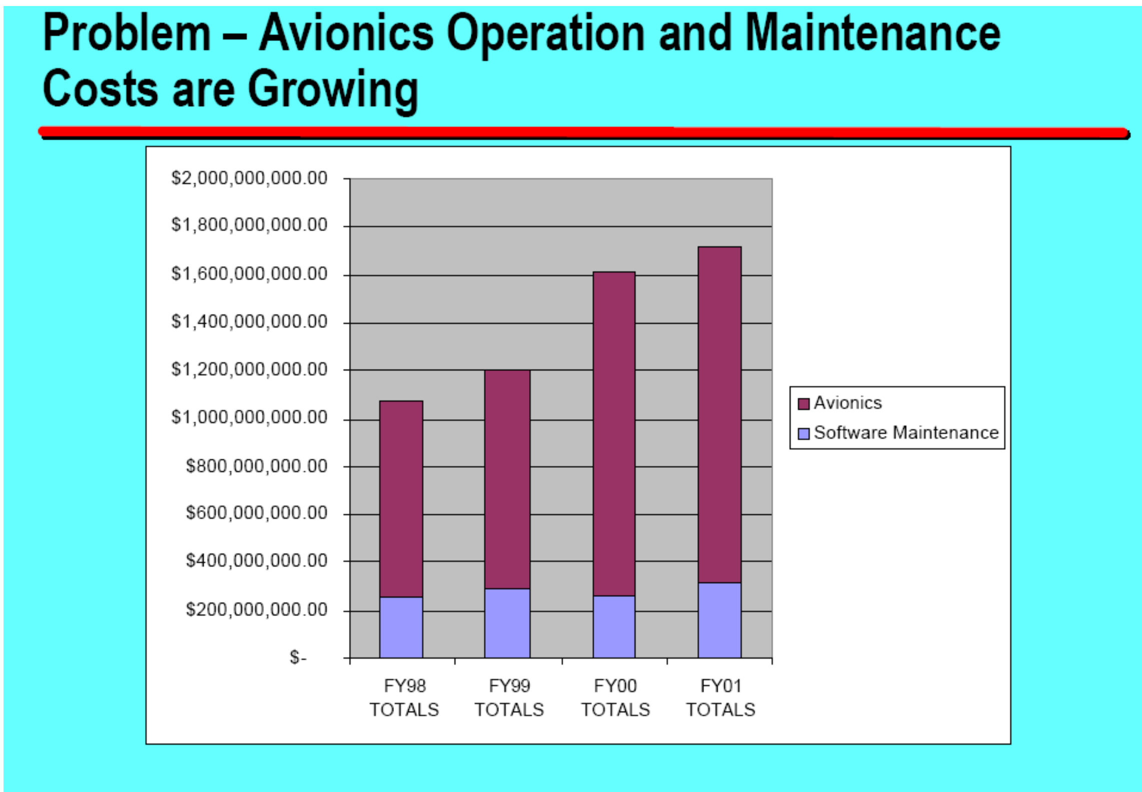

Figure 5 Cost Escalation Graph

The steadily escalating costs of aging avionics are shown in Figure 5 which is part of a presentation to the Committee on Aging of US Air Force Aircraft in November 2003.[22] This presentation emphasized the need to develop modular open architecture systems which use standard well defined interfaces and are compatible with other aircraft.

An option being looked at currently by the Air Force to rebuild its long-neglected electronic warfare capabilities is to add a powerful, long-range jamming system to the B-52 by leveraging technologies developed for other aircraft. Unfortunately, this area of high concern is apparently not being addressed with any appropriately funded effort for electronic warfare, so very soon the USAF will have no dedicated platform for electronic attack.[23] The impending retirement of the EA-6B in 2010 and limited number of new EA-18G “Growler” procured by the US Navy will leave a gap in tactical jamming environment for strike package aircraft. Installing a new system on the B-52 leveraging its range and payload flexibility would kill two birds with one stone, namely the aircraft self-protection and the strike package protection.

The new system developed by BAE Systems involves generating narrow, high-gain beams which can be used at long ranges. By not using broad-area barrage jamming, power requirements drop dramatically for its electronic attack system. Experts believe the advanced capability would also include refined deception techniques. For example, instead of blanking enemy operators' scopes with barrage jamming, it fools enemy radars about the actual location and numbers of targets. By capturing incoming signals, altering and then re-emitting them, the system also can change the perceived range and speed. These techniques have expanded beyond the dimension of time by altering the type of target the enemy sees. By offering what appears to be a different target to each radar in a networked enemy air defense system, it becomes extremely hard to correlate the separate returns into an object that can be targeted.

The necessary wiring for the modification has been simplified and control capability has been added at one of the existing crew positions, much of EW software from the F-35

Joint Strike Fighter program has been reused and reduced power consumption to 60 kw of the 100 kw available. The plan is to produce a jamming/electronic attack system capable of accepting rapid technology upgrades that can eventually be shifted from older aircraft like the B-52 to next-generation jamming platforms like an unmanned combat aircraft or some derivative of the F-35 Joint Strike Fighter. If successful, the jamming system would be near real time and have the ability to re-task itself to increase performance by the insertion of new cards or by plugging into additional networks where it recognizes processors with additional capabilities and uses them. It also has the capability, as of this year, to identify itself by location and will reprioritize its tasks based on the available processing power within the network.

Another element that could be used for the B-52 is the mid-band frequency spectrum system for the arrays, amplifiers, techniques generators and techniques being built into small pods for the Air Force Special Operations Command (AFSOC) EC-130 Compass Call Spear program or the low-band transmitter capability built for the ICAP III (Improved Capability) EW upgrade for the EA-18G. If this system is installed, the capabilities on the B-52 would include reactive jamming, compensation for wing flexing to prevent wire chaffing and ensuring the necessary degree of cooling is available to extend LRU life.[24]

The stand-off jamming option called the core component jammer (CCJ) would significantly improve the self-protection capabilities of the B-52 EW suite. The CCJ would use two large wingtip pods to jam enemy radar defenses from long range. The system is a high power multi-beam phased array consisting of transmitters and exciters which will cover all three threat bands, low, mid and high.[25] Upgrades would allow expanding the B-52's electronic attack role to leading strike packages and include higher threat missions where its self-protection capabilities would be critical. This CCJ system is being developed by ITT, Boeing, Northrop Grumman, and Raytheon. A five-year $68M study has been approved and an additional $15M B-52 pod integration contract has also been awarded.[26] The premise of the program is to produce a limited amount of the wing mounted standoff jammer pods leveraging existing technology aimed at defeating air defenses and early warning radars by jamming low frequency wave forms. The B-52 is an ideal platform for this due to its ability to fly long distances, loiter for extended periods and ability to carry the large payload including on board pods and generators needed to power them.

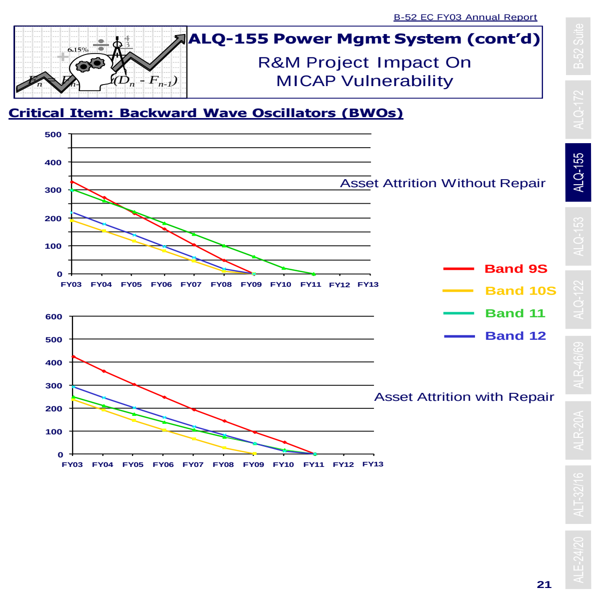

Figure 6 ALQ-155 Projected Unsupportability Graph

Conclusion

Although the B-52 is almost 60 years old it still remains the backbone of the strategic bomber fleet because of the number of available airframes and the flexibility to perform a wide range of missions form close air support to nuclear deterrence. Despite the relative health of the ALQ-155 today the fact remains that the EW system's age and obsolete nature requires ever increasing funding to merely sustain the existing system. Unfortunately, this funding provides little towards capability preservation or improvement and beyond 2009 the system will be unsupportable as shown in Figure 6. The ALQ-155 capability should either be replaced by a system similar to the one discussed previously or an evolutionary spiral to the ALQ-155 which is modified and integrated with the ALQ-172. The Air Force must allocate more funding to this effort for the aircraft to remain viable.

Integration of the ALQ-172 and ALQ-155 capability provides the ideal opportunity to update and improve the B-52's EW suite. The ALQ-172 self-protection system, which has commonality with AFSOC aircraft, should be sustained and provide the foundation on which to evolve an integrated self-protection capability. Whatever the solution, the self-protection capability must be improved soon to continue to support the Global Strike Task Force and the Global Response Concept of Operations in the area of survivability failing to do so would relegate the B-52 to a strictly stand-off cruise missile role. With decreasing forward presence, strategic bomber tests and modifications that foster our flexible autonomous capabilities must receive high priority and high-level Air Force advocacy if our threat of power projection is to be credible.

Figure 7

Supporting Data

B-52 MICAP TOP 10: OCT 07-OCT 08

NSN	Nomenclature	#	Hours
1560-00-862-6191 FG	Nose Cover Assembly Seal	15	36,373
1560-00-779-7968 FG	Engine Mount Link	11	29,557
5821-01-459-2277 AY	Steerable Television Camera	7	29,123
1280-01-398-3958	FLIR Sensor Assembly	6	25,658
1560-00-591-0247 FG	Link Assembly	2	9,985
4810-00-554-8862 TP	Solenoid Valve	2	8,110
5925-01-533-2511	Circuit Breaker	6	7,589
1680-01-500-9856 FG	Flap Drive Angle Gear Box Assembly	5	7,362
6150-01-160-3189 FG	Wiring Harness	5	6,813
4730-00-627-3429 FG	Tolerance Coupling	1	6,068

166,638 Total

Annex A

B-52 Defensive Avionics Support Survey

Please return your responses to Maj James Zick by e-mail to (james.zick@maxwell.af.mil)

PURPOSE: This survey will help determine whether ALQ-155 reliability is having an effect on the maintenance unit's ability to repair the system. The expected survey participants are maintenance managers at all levels of the Maintenance Group down to the flight chief level both on the flightline and in the backshop.

DIRECTIONS: Please highlight your response and add any additional comments in the comment blocks.

What rank are you?
a. E-1_E-5 b. E-6_E-9 c. O-1_O-3 d. O-4_O-6

In the following series of questions rate how much you agree with each statement on a scale of 1 to 5	Strongly Disagree 1	Disagree 2	Neither Agree or Disagree 3	Agree 4	Strongly Agree 5
1. The reliability of the LRUs in the ALQ-155 system is satisfactory.	1	2	3	4	5
2. There is often a shortage of serviceable ALQ-155 assets at homestation.	1	2	3	4	5
3. The unit's Readiness Spares Packages are usually fully stocked with ALQ-155 LRUs.	1	2	3	4	5
4. The depot consistently has enough serviceable spare ALQ-155 assets on hand to support base needs.	1	2	3	4	5
5. The depot has regularly said they are short of reparable carcasses.	1	2	3	4	5
6. The ALQ-155 LRU's are received from depot in a timely manner. Please note how long it takes to receive these LRUs from depot from time of requisition below.	1	2	3	4	5
7. The required LRUs are CANNed if there are none in supply.	1	2	3	4	5
8. How many CANN actions per week occur for the ALQ-155 LRUs on average? Answer below.	1	2	3	4	
9. How many manhours on average does it take to CANN these LRUs? Answer below.	1	2	3	4	5
10. LRUs are CANNed from aircraft other than scheduled CANN jet. Specify what type of aircraft these parts usually come from i.e. Phase jet or WLT jet. Answer below.	1	2	3	4	5
11. How often does the practice of CANNing ALQ-155 parts from other than scheduled CANN jets occur per month? Answer below.	1	2	3	4	5
12. Lack of LRUs on the flightline has resulted in late takeoffs or missed missions. If so, how many on average per month? Answer below.	1	2	3	4	5

13. The LRUs for the ALQ-155 system have base level repair authorized.	1	2	3	4	5
14. The capacity of the backshop is enough to keep up with the demand from flying unit.	1	2	3	4	5
15. The avionics backshop has problems getting the required piece/parts from vendors or depot to repair the LRUs. If so what is the average number of LRUs that go AWP each month and how long do they stay AWP on average? Answer below.	1	2	3	4	5
16. There is capability to repair ALQ-155 LRUs at deployed locations.	1	2	3	4	5
17. The ALR-20 upgrade from 6-gun CRT to Condor Systems screen has been completed.	1	2	3	4	5
18. If upgrade has been completed or partially complete has the Condor System screen met reliability expectations and has it improved the overall system performance. Answer below.	1	2	3	4	5

Survey Results

Question	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1		12		12	
2	6	15		3	
3		9	6	9	
4		2	9	12	
5		6	15	3	
6		6	6	6	6
7			3	12	6
8					
9					
10	12	6			
11					
12	15	3			
13	9	9		6	
14	9		9		3
15	9	3	6		3
16	18		3		
17		3			9

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